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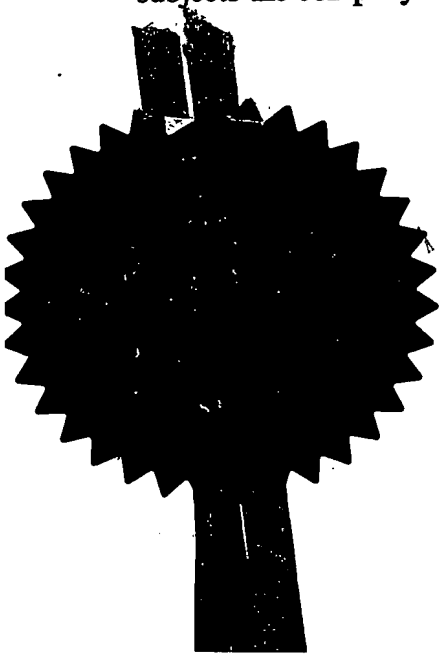

Signed Andrew Gerrey

Dated 19 May 2004

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Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road
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1. Your reference — 2003P07081 GB / P68 / JJP / JJP

2. Patent application number *(The Patent Office will fill in this part)* — 0311277 8 — 16 MAY 2003

3. Full name, address and postcode of the or of each applicant *(underline all surnames)* — ROKE MANOR RESEARCH LIMITED
Old Salisbury Lane, Romsey
Hampshire SO51 OZN

Patents ADP number *(if you know it)* 56155500 6

If the applicant is a corporate body, give the country/state of its incorporation — UNITED KINGDOM

4. Title of the invention — Method of operating a wireless service

5. Name of your agent *(if you have one)* — Jan Payne

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

Siemens plc
Intellectual Property Department
The Lodge, Roke Manor
Romsey, Hampshire SO51 0ZN

Patents ADP number *(if you know it)* 85301230 01

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:
a) any application named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body.

Yes

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See note (d))

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10. If you are also filing any of the following, state how many against each item.

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Statement of inventorship and right to grant a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. I/We request the grant of a patent on the basis of this application

Signature: JPayne — Date: 16.05.2003

Jan Payne
Chartered Patent Agent

12. Name and daytime telephone number of Person to contact in the United Kingdom: Jan Payne — + 44 1794 83 3866

Patents Form 1/77

IDNR: 7100/V: 02-1.00/B: Val

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METHOD OF OPERATING A WIRELESS SERVICE

This invention relates to operation of a wireless service, in particular a service which can be broadcast to its users. The particular examples described below relate to second generation (2G) mobile phone systems, but the principle of this invention is equally applicable to any system in which data can be broadcast to users over a wireless network, whether using 2G, 3rd generation (3G) or any other existing or future network system.

For some existing mobile services, there is a requirement to count the number of users interested in receiving a notified multimedia broadcast/multicast service (MBMS), and also to count clustering of these users around the base transceiver station (BTS). In MBMS it has been proposed that counting of users interested in a service is done, in order to determine the most efficient way to deliver the data to the users. The delivery may be either by a point to multipoint (ptm) bearer, or on a normal point to point (ptp) bearer as used in general packet radio service (GPRS) today.

This simplistic approach does not provide an efficient way to measure the distance of a mobile station (MS) from the BTS, and hence gives no indication of the power level required to provide an acceptable delivery. There are methods by which individual mobile stations communicating with a base station can modify the power level of the base station transmission, so that the minimum necessary power is used. These involve the base station reducing its transmission power in successive iterations until the mobile station no longer receives an acceptable signal, then increasing the power just enough to communicate again. This method would be entirely inappropriate for a potential broadcast scenario, as all the resources would be taken up in determining the power level and none in actually communicating.

In accordance with the present invention, a method of operating a mobile wireless service comprises causing a network controller to broadcast to all mobile stations in a cell an offer of service; requesting from each mobile station an indication of interest in the offered service; receiving from each interested mobile station data enabling the position or received signal quality of each mobile station within the cell to be determined; analysing the arrangement of interested mobiles in one or more predefined areas; and instructing each interested mobile which is out of range of a subsequent broadcast transmission to request a point to point channel to receive the service.

As an example, consider the situation shown in Figure 1, where users are randomly distributed around the BTS marked by X. If the majority of users are in area A then less power would be needed for a ptm bearer than if the majority of the users were in either area B or C. If a base station controller (BSC) provides the ptm bearer in only region A, then an indication needs to be sent to all MS in regions B and C that they should request a ptp bearer for the MBMS session. Current practice is simply to broadcast at full power if the number of interested MS's in a cell are deemed sufficient to use broadcast mode at all.

The present invention provides a mechanism for the MS in the cell interested in MBMS to respond to the MBMS notification in a quick and efficient manner and for the BTS to determine suitable mechanisms for communication with interested MS's. For example, the MS could use the random access channel (RACH), the packet random access channel (PRACH) or the proposed MBMS random access channel (MRACH) logical channels to respond to the MBMS notification. When the MBMS notification is sent in a cell, additional signalling instructs the MS to provide information to assist the BTS in determining the distance of the MS from the BTS within the sector/cell and so to determine the communication mechanism to be used.

The count indication message includes a list of values which will be used in this calculation and an associated bit pattern. The bit pattern sent in the notification message will correspond to received quality/power levels in the MS, and allows the MS to indicate the radio quality it is receiving in the cell. The BSC can set these to be any value which is useful in calculating the location of MS, but in the example below we use RX_LEV and RX_QUAL, two well known GPRS power parameters.

Upon receiving this notification/count indication, the MS responds to the BSS, indicating that it wants to receive a given service. This indication of service may be explicit and provide a unique identification of the required service or implicit by having only one outstanding notification/counting request at one time. The MS should also respond indicating the values of the received power levels using the bit pattern provided in the counting to allow the BSC to use an algorithm to determine whether ptm or ptp should be used, and at what power level a ptm bearer should be sent (i.e. to reach all MS in area A above with a ptm bearer, and then provide a ptp bearer to all other MS in areas B and C). The advantage of this is that unlike a blanket broadcast, the chances of interfering with transmissions in an adjacent cell are reduced. Only in those cases where the number of MS present in the cell is sufficient for a broadcast and those MS are well spread over the full area of the cell will full power be needed.

There may still be occasions when this happens and coincides with a similar situation in a neighbouring cell, so giving rise to a reduction in quality, but less often.

The BSC will receive a number of responses from many mobiles, and each will contain an indication of the service required and the received power/quality levels. This information is then used in the BSC to calculate the preferred ptm channel usage.

As an example sequence of events the following can be considered.

1. Count indication sent

The message sent from the base station system (BSS) in the cell in order to determine the need or not for a ptm or number of ptp MBMS bearers may contain the following:

- An indication that a response is required
- A service identity
- A list of received powers/received quality in the MS and associated bitmaps

for the response on the MRACH (as an example, RX_LEV and RX_QUAL are used here, but others could be used)

The RX_LEV (received power level) tells the BTS the received power at the MS, whereas the RX_QUAL provides an approximation of the carrier to interface ratio (C/I) received at the MS.

2. The MS responds on a random access channel indicating the various parameters requested in the notification message

The more sophisticated the request for information, the more likely it is that the MRACH will have to be used for the response message. The RX_LEV and RX_QUAL are both 3 bits in length, and hence the resulting combination of response could require up to 64 different responses. This can be managed in 6 bits, leaving 5 bits for the response indication on the MRACH if an 11 bit access burst is used. See Figure 2 for a possible implementation of the 11 bit access burst where the first 5 bits are fixed and used to indicate notification response.

Also, the BTS may provide the timing advance parameters to the BSS entity managing MBMS. Timing advance (TA) values may be calculated by the BTS upon receipt of an uplink (UL) message and give the network an indication of the distance of the MS from the BTS. The BTS would need to provide this information to the BSS for the BSS to include the TA in its calculations.

3. BSS calculates ptm or ptp

Any and all of the received values may be fed into an implementation specific algorithm in order to allow the operator to take into account the full operating environment before choosing to provide a ptm bearer or number of ptp bearers or combination for the delivery of MBMS.

4. Assignment

The BSS uses the codes received in the responses (indicating the RX_LEV and RX_QUAL) to indicate to each group of MS that they should use a ptp or ptm bearer. For example, all MS with an RX_LEV higher than a given value should use the ptm channel, and those with the RX_LEV below a certain value should use a ptp channel.

It should be noted that the specific values provided herein are an example of possible parameters that may be used in the determination of the need for a single ptm or a number of ptp bearers, or a combination of both.

In Figure 3, the BSS sends a count indication message (step 1) to a plurality of mobile stations. This message contains measurement values and corresponding bitmaps for response. Each MS sends a response (step 2) containing a short service ID of 5 bits and power indication bitmaps of 6 bits. The BSS calculates timing advance for all responses (step 3), provides timing advances and responses from all MS's to the BTS (step 4) and calculates a preferred distribution of ptm and ptp bearers (step 5). The BSS then sends a message (step 6) re provision of ptm bearers (a list of power indication bitmaps which should use the ptm bearer) and also sends a message (step 7) re indication of use of ptp bearers (a list of power indication bitmaps which should use the ptp bearer).

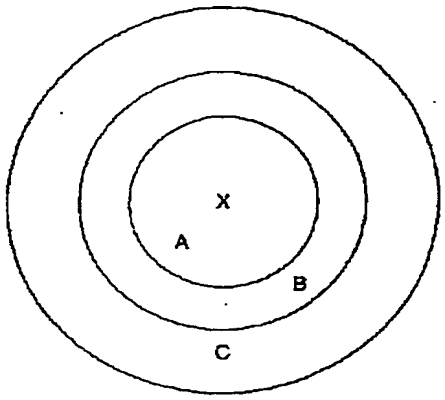

Figure 1 Cell layout with three areas for MBMS algorithm

1	2	3	4	5	6	7	8	9	10	11
Notification response					RX_LEV			RX_QUAL		

Figure 2 11 bit MRACH access burst

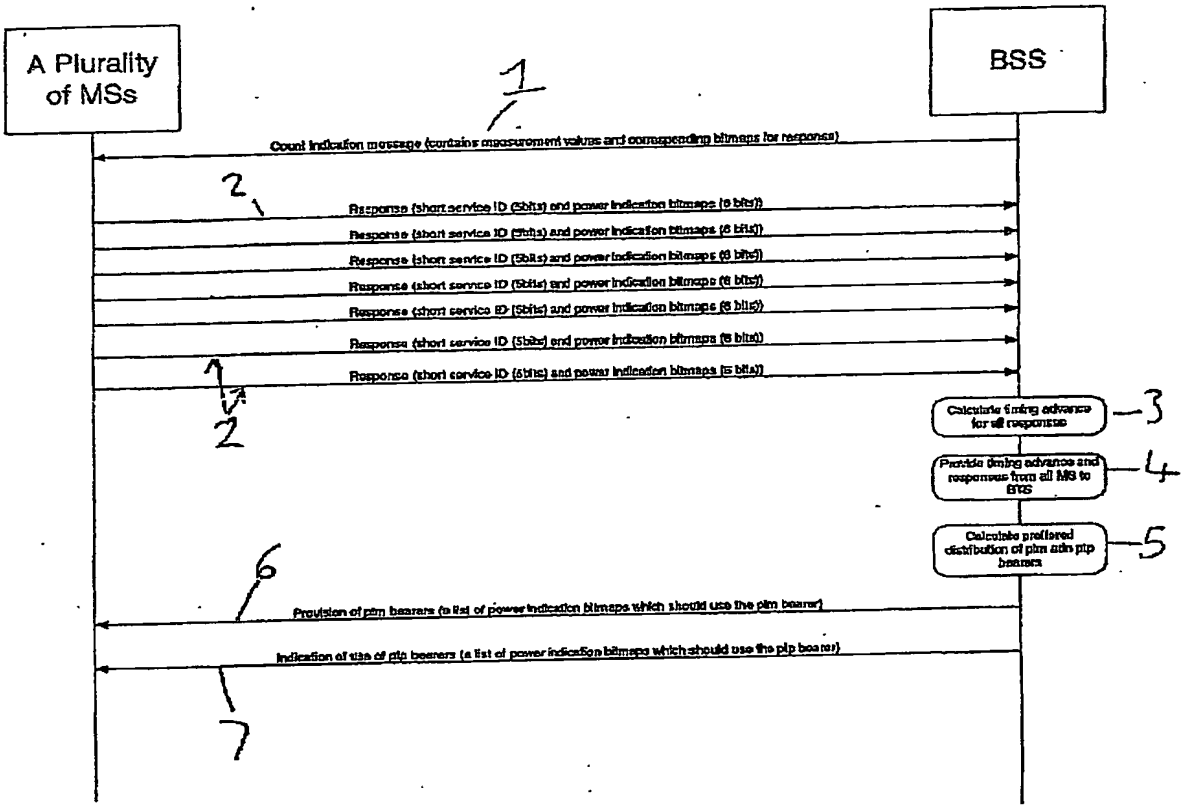
A Plurality of MSs
BSS
1
Count indication message (contains measurement values and corresponding bitmaps for response)
2
Response (short service ID (5bits) and power indication bitmaps (8 bits))
Response (short service ID (5bits) and power indication bitmaps (8 bits))
Response (short service ID (5bits) and power indication bitmaps (8 bits))
Response (short service ID (5bits) and power indication bitmaps (8 bits))
Response (short service ID (5bits) and power indication bitmaps (8 bits))
Response (short service ID (5bits) and power indication bitmaps (8 bits))
Response (short service ID (5bits) and power indication bitmaps (8 bits))
2
Calculate timing advance for all responses
3
Provide timing advance and responses from all MS to BSS
4
Calculate prefered distribution of ptm adn ptp bearers
5
6
Provision of ptm bearers (a list of power indication bitmaps which should use the ptm bearer)
Indication of use of ptp bearers (a list of power indication bitmaps which should use the ptp bearer)
7

Figure 3.

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